What is claimed are:

1. An optical multiplexing apparatus for multiplexing a plurality of optical signals having different wavelengths, comprising:

first optical multiplexing means for multiplexing, among a plurality of optical signals that are input with directions of linear polarization of neighboring wavelengths being differed to each other and are successively given wavelength numbers depending upon the wavelengths, optical signals corresponding to odd wavelength numbers, while maintaining their polarization states;

second optical multiplexing means for multiplexing optical signals corresponding to even wavelength numbers among said plurality of optical signals, while maintaining their polarization states; and

third optical multiplexing means including:

a first input unit for filtering the optical signals multiplexed by said first optical multiplexing means in accordance with filter characteristics that include a transmission wavelength band with the wavelengths of odd numbers as centers, and have the band width of said transmission wavelength band which is narrower than the band width of transmission wavelength band of filter characteristics of said first optical multiplexing means;

a second input unit for filtering the optical signals multiplexed by said second optical multiplexing means in accordance with filter characteristics that include a transmission wavelength band with the wavelengths of even numbers as centers, and have the band width of said transmission wavelength band which is narrower than the band width of transmission wavelength band of filter characteristics of said second optical multiplexing means; and

an output unit for multiplexing the optical signals output from said first input unit and the optical signals output from said second input unit to output the multiplexed signal light.

2. An optical multiplexing apparatus according to claim 1, wherein said plurality of optical signals are input with directions of linear polarization of neighboring wavelengths being orthogonal to each other.

3. An optical multiplexing apparatus according to claim 1, wherein said third optical multiplexing means is provided with a function for maintaining the polarization state.

4. An optical multiplexing method of multiplexing a plurality of optical signals having different wavelengths, comprising:

a first optical multiplexing step of multiplexing, among a plurality of optical signals that are input with directions of linear polarization of neighboring wavelengths being differed to each other and are successively given wavelength numbers depending upon the wavelengths, optical signals corresponding to odd wavelength numbers, while maintaining their polarization states;

second optical multiplexing step of multiplexing optical signals corresponding to even wavelength numbers among said plurality of optical signals, while maintaining their polarization states; and

third optical multiplexing step of:

filtering the optical signals multiplexed by said first optical multiplexing step in accordance with filter characteristics that include a transmission wavelength band with the wavelengths of odd numbers as centers, and have the band width of said transmission wavelength band which is narrower than the band width of transmission wavelength band of filter characteristics of said first optical multiplexing step;

filtering the optical signals multiplexed by said second optical multiplexing means in accordance with filter characteristics that include a transmission wavelength band with the wavelengths of even numbers as centers, and have the band width of said transmission wavelength band which is narrower than the band width of transmission wavelength band of filter characteristics of said second optical multiplexing step; and

multiplexing the respective filtered optical signals to output the multiplexed signal light.

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